UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

-TP

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/716,367	11/18/2003	Joseph J. Lacey	390086.95207	6672

28382 7590 11/03/2005

QUARLES & BRADY LLP
411 E. WISCONSIN AVENUE
SUITE 2040
MILWAUKEE, WI 53202-4497

EXAMINER	
ROSENBERGER, FREDERICK F	
ART UNIT	**PAPER NUMBER**
2884	

DATE MAILED: 11/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/716,367	LACEY ET AL.	
	Examiner	Art Unit	
	Frederick F. Rosenberger	2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 5-20* is/are rejected.

7)☒ Claim(s) *4* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's amendment, filed 8/8/2005, has been received and entered. No changes have been made to the specification or claims. Accordingly, claims 1-20 remain pending in this application.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-3, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshioka (Japanese Publication # 61-201182A) in view of Pohan et al. (US Patent # 6,925,142).

Yoshioka discloses a detector assembly for use in a computed tomography scanner, the detector assembly comprising:

A detector array **10** (Figures 1 and 2);

A temperature sensor **S3** coupled to the center of the detector array **10** and temperature sensors **S1** and **S2** coupled to the opposing ends of the detector array **10**;

A heater **H3** coupled to a center portion of the detector array **10** and heating elements **H1** and **H2** coupled to the opposing ends of the detector array **10**;

And a controller device **11a, 11b, 11c** electrically coupled to the temperature sensors to receive an actual temperature signal, the controller device comparing the actual temperature signal to a set point and driving the heater to maintain the heaters **H1-H3** to maintain the actual temperature substantially at set point, thus providing a uniform temperature profile along the array (Figure 3 and page 6 of the translation, lines 3-6).

Yoshioka is silent with regards to the use of thermoelectric coolers at the opposing ends of the detector array, instead opting for surface heaters with no definition of variations.

However, it is well known in the art that thermoelectric coolers are capable of being used in place of standard heaters as a heating/cooling element. For example, Pohan et al. disclose an X-ray CT detector wherein heating elements **11** have been coupled to a detector array **7** through printed circuit board **6** (Figure 2) for controlling the temperature of the detector array **7**. Pohan et al. point out that these heating elements

can take the form of Peltier devices (i.e. thermoelectric coolers) (column 4, lines 23-27). Further, Pohan et al. disclose that the use of thermoelectric coolers in such a temperature control setup is desirable since the added functionality of the thermoelectric cooler allows for cooling the detector array and the regulating electronics should the temperature of those elements become too high (column 2, lines 25-29).

Thus, it would have been obvious for a person of ordinary skill in the art to change at least one of the outlying heaters **H1** and **H2** of Yoshioka to thermoelectric coolers, along with the appropriate controller modifications, to enable cooling of the detector array when ambient temperatures are too high, as taught by Pohan et al.

5. Claims 5, 6, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable Yoshioka and Pohan et al., as applied to claims 1 and 10 above, and further in view of internet document entitled "Designing with Thermoelectric Coolers" (hereinafter referred to as Design Guide) and "Thermoelectric Reference Guide-Heat Sink Considerations" (hereinafter referred to as Ferrotec).

Yoshioka and Pohan et al. disclose all the limitations of the parent claims 1 and 10, as described above. However, the combination of Yoshioka and Pohan et al. are silent with regards to the method for heat dissipation from the thermoelectric cooler.

It is well known in the art that the use of a thermoelectric cooler requires the use of some form of heat dissipation method, whether natural or active heat dissipation. As Design Guide points (page 3, entitled "What is the required balance system needed to enable a TEC?"), without a suitable heat dissipation method to remove heat from the

hot side, the thermoelectric cooler will eventually overheat and fail. Acceptable heat dissipation methods include natural convection extruded fins (i.e. traditional heat sink), forced convection fins stack (i.e. fan directing air at a heat sink), or a fluid cooling heat exchanger. Ferrotec also points out that the particular selection of an appropriate heat dissipation is dependent upon the particular application. Lower power applications require only a natural convection heat sink (section 5.2.1) while higher power applications (i.e. those that require more heat removal) require at least forced convection heat sinks (section 5.2.2).

Thus, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to apply heat dissipation methods, either passive heat sinks via natural convection or active heat sinks through directed fans, for the thermoelectric coolers, to prevent failure of the thermoelectric coolers, as taught by Design Guide and Ferrotec.

6. Claims 7, 8, and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshioka, Pohan et al., Design Guide and Ferrotec, as applied to claim 5 above, and further in view of Snyder et al. (US Patent # 6,249,563).

The combination of Yoshioka, Pohan et al., Design Guide, and Ferrotec discloses all of the limitations of parent claim 5, as described above, and most of the limitations of claims 16-20. However, the combination is silent with regards to rails being coupled to opposing sides of the detector array with a conductive insert coupled to one of the rails for transferring heat along the rail.

Snyder et al. teach a temperature control method for an X-ray detector employing a pair of rails **42a**, **42b** (Figure 3) mounted on opposing sides of a detector array **39** with conductive inserts **46** along the length of the rails enabled for transferring heat along the length of the array (column 5, lines 3-9). As Snyder et al. illustrate, such a configuration enables the rapid transfer of heat from detector locations at different temperatures, thereby encouraging an isothermal condition among the detector array elements (column 5, lines 12-17).

Thus, it would have been obvious to a person having ordinary skill in the art to modify the combination of Yoshioka, Pohan et al., Design Guide, and Ferrotec, to include a pair of rails with conductive inserts to enhance heat distribution along the entire length of the detector array and assist in the maintenance of a uniform temperature profile, as taught by Snyder et al.

With regards to claim 8, although Snyder et al. teach a conductive insert which is a fluid filled heat pipe, the particular selection of the conductive insert material is an obvious matter of design choice since applicant has not disclosed that the particular material selection solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with a fluid filled heat pipe with high thermal conductivity, as proposed by Snyder et al.

With regards to claim 20, Yoshioka demonstrates that the temperature in the center of the detector (Figure 3 – location **III**) is higher than it would be at the extreme ends of the detector array (Figure 3, to the left of location **I** and to the right of location **II**).

7. Claims 9 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshioka and Pohan et al., as applied to claims 1 and 10 above, and further in view of Sasaki et al. (US Patent # 6,411,672).

The combination of Yoshioka and Pohan et al. discloses all of the limitations of parent claims 1 and 10, as described above. However, the combination is silent with regards to providing an insulating cover for housing the detector array from ambient thermal variations.

Sasaki et al. teach a radiation detector for X-ray CT applications wherein the detector array **25** (Figure 2) is encased in a case **17** with insulation **21**. The insulation is configured such that it is in thermal communication with all edges of the detector array through the working fluid except for a window **16** (Figures 3) on the top of the detector array. Such a setup enables a uniform internal temperature with high thermal conductivity in the interior of the detector assembly while enabling high insulation with respect to the exterior of the detector assembly (column 3, lines 39-45).

Thus, it would have been obvious for a person having ordinary skill in the art to modify Yoshioka and Pohan et al. to include an insulating cover for housing the detector array from ambient conditions so as to better maintain an internal isothermal condition, as taught by Sasaki et al.

8. Claims 11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshioka and Pohan et al., as applied to claim 10 above, and further in view of Snyder et al. (US Patent # 6,249,563).

The combination of Yoshioka and Pohan et al. discloses all of the limitations of parent claim 10, as described above. However, the combination is silent with regards to a heat conductive material coupled along the length of the detector array for transferring heat.

Snyder et al. teach a temperature control method for an X-ray detector employing a pair of rails **42a**, **42b** (Figure 3) mounted on opposing sides of a detector array **39** with conductive inserts **46** as heat conductive material coupled along the length of the rails enabled for transferring heat along the length of the array (column 5, lines 3-9). As Snyder et al. illustrate, such a configuration enables the rapid transfer of heat from detector locations at different temperatures, thereby encouraging an isothermal condition among the detector array elements (column 5, lines 12-17).

Thus, it would have been obvious to a person having ordinary skill in the art to modify the combination of Yoshioka, Pohan et al., Design Guide, and Ferrotec, to include a pair of rails with conductive inserts as heat conductive material to enhance heat distribution along the entire length of the detector array and assist in the maintenance of a uniform temperature profile, as taught by Snyder et al.

Response to Arguments

9. Applicant's arguments, see page 8, paragraph 2, filed 8/8/2005, with respect to the rejection(s) of claim(s) 1-3 and 5-20 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

However, upon further consideration, a new ground(s) of rejection is made in view of Pohan et al. (US Patent # 6,925,142).

Although the Lacey reference (US Patent 6,459,757) discloses the use of thermoelectric coolers in the maintenance of a temperature profile of a X-ray CT detector, applicant is correct in that the Lacey reference only qualifies as prior art under 35 U.S.C. 102(e) and thus cannot be used to preclude patentability due to common ownership.

In light of this, Pohan et al. disclose an X-ray CT detector that also uses a thermoelectric cooler (i.e. Peltier device) to control the temperature of the detector array. Although Pohan et al. qualifies as prior art under 35 U.S.C. 102(e) only, said patent does not have common ownership with the present application and thus can be relied upon in a 35 U.S.C. 103(a) rejection.

Applicant's attention is further directed to the Yoshida reference (Japanese Patent # 10146332-A) cited but not applied in the present Office action, which illustrates temperature control using a thermoelectric cooler to heat/cool a CT detector array.

Allowable Subject Matter

10. Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter:

Claim 4, when incorporating the limitations of parent claims 1 and 3, is directed towards a detector assembly for use in a CT scanner, wherein the detector assembly comprises a detector array with a thermoelectric cooler, a centrally located heater coupled to the array, an appropriately located temperature sensor coupled to the array, and a controller for controlling the temperature profile of the detector array to have a parabolic shape.

While aspects of the invention can be found in the prior art, the temperature profile having a parabolic shape is a unique feature of the present invention. Yoshioka discloses a parabolic temperature profile (see Figure 9), but cites this as a negative limitation of prior art temperature stabilization systems (page 4 of the translation, lines 4-15). In fact, the prior art as a whole emphasizes attainment of a uniform temperature profile for the detector profile. As such, applicant's disclosure provides a novel and nonobvious improvement over the prior art. Accordingly, the claim 4 would be allowable.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yoshida (Japanese Patent # 10146332-A) discloses an X-ray CT device wherein a thermoelectric cooler **10** is used in conjunction with a heater **9** and a temperature sensor **18** to control the temperature of a detector array **12** (Figure 1).

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Frederick F. Rosenberger whose telephone number is 571-272-6107. The examiner can normally be reached on Monday-Friday 8:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Frederick F. Rosenberger
Patent Examiner
GAU 2884

DAVID PORTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800